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FINAL EXAMINATION

TRIMESTER 2, 2016/2017

PSM0325 – INTRODUCTION TO PROBABILITY AND STATISTICS
(Foundation in Information Technology / Life Sciences)

24 FEBRUARY 2017
3.00 p.m. – 5.00 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of **TWO** pages excluding the cover page and the Appendix.

2. Answer **ALL FIVE** questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please write all your answers in the Answer Booklet provided. All necessary working steps **MUST** be shown.

4. **Statistical table** is provided.

Instruction: Answer all **FIVE** questions.

Question 1 (10 marks)

The heights of a group of 95 students randomly selected from a class is given as follows:

Height	Number of Students
90 – 95	9
96 – 101	18
102 – 107	30
108 – 113	21
114 – 119	12
120 – 125	5

Calculate

a.   the mean height of the students.   (5 marks)

b.   the standard deviation of the height of the students.   (5 marks)

Question 2 (10 marks)

a.   Mr Tan owns three retail stores that delivers the company's online orders. Retail store A makes 30% of the total deliveries, while retail stores B and C make 35% of the total deliveries each. It is known that the percentage of late deliveries made by store A is 5%, store B is 7%, and store C is 10%.

   An online order is selected at random. If the delivery of the order is late, find the probability that store B made the delivery.   (3 marks)

b.   The probability density function of a random variable X is given below:

$$f(x) = \begin{cases} \dfrac{x^2 + 2}{15} & ; 0 \le x < 3 \\ 0 & ; \text{otherwise} \end{cases}$$

   Calculate the mean and standard deviation of X.   (7 marks)

Question 3 (10 marks)

a.   The probability that a participant who enrolled in a competition will pass the first round is 0.75. If 15 participants are randomly selected from the competition, find the probability that

   i.   at least 10 of them will pass the first round.   (2 marks)

   ii.   at least 7 of them will not pass the first round.   (2 marks)

b.   The lifespan of an electrical product is found to be normally distributed with a mean of 10 years and a standard deviation of 0.5 years.

      i.   Find the probability that the lifespan of the product will be less than 9 years.   (3 marks)

      ii.   The probability that the lifespan of the product will exceed k years is 0.15. Find the value of k.   (3 marks)

Question 4 (10 marks)

a.   10 students registered for a time management class. All the students are required to collect information from the library. The number of times each of the students visited the library are recorded:

     8   15   12   9   7   8   11   9   10   9

List all the possible samples of size nine from this data and construct a sampling distribution of the sample mean.   (5 marks)

b.   The height of a plant has a mean of 95 cm with a standard deviation of 10 cm. 50 plants are randomly selected from a certain plot and their heights are recorded. Find the probability that the mean height of the 50 plants will be within 2 cm of the population mean.   (5 marks)

Question 5 (10 marks)

The mean time taken by the trainees of a training program to complete a course is at least 18 months. A new teaching method is implemented with a group of trainees in an effort to reduce the time taken by the trainees to complete the course. The mean time taken by 80 of these trainees to complete the course was found to be 17 months, with a standard deviation of 5 months.

a.   Based on the time taken by the 80 trainees, construct a 99% confidence interval for the mean time taken by all the trainees to complete the course.

(4 marks)

b.   At the 0.01 level of significance, is there evidence to show that the new teaching method is effective in reducing the time taken by the trainees to complete the course?   (6 marks)

End of Paper

FORMULA

For Grouped Data

1. Mode $= L + \left[\dfrac{f_m - f_B}{\left(f_m - f_B\right) + \left(f_m - f_A\right)} \right] c$

2. Median $= L + \left[\dfrac{\left[\dfrac{\sum f + 1}{2} \right] - F_L}{f_m} \right] c$

3. Mean $=$

Sample	Population
$\bar{x} = \dfrac{\sum mf}{\sum f}$	$\mu = \dfrac{\sum mf}{\sum f}$

4. Variance $=$

Sample	Population
$s^2 = \dfrac{\sum m^2 f - \dfrac{\left(\sum mf\right)^2}{\sum f}}{\left(\sum f\right) - 1}$	$\sigma^2 = \dfrac{\sum m^2 f - \dfrac{\left(\sum mf\right)^2}{\sum f}}{\sum f}$

5. Standard Deviation $= \sqrt{Variance}$